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Superintendent
Noatak National Preserve
National Park Service
Kotzebue, Alaska 99752

Attn: Kate Roney
Resource Management Specialist

Enclosed is the final report, A Survey for Cliff-Nesting Birds of Prey Along the Noatak River, Alaska. I hope you find the report useful and that it stimulates continued interest in the raptors of the Noatak Valley. Also enclosed is a list of those to whom I am distributing a copy. Only those whose names are followed by an asterisk are being sent a copy of Appendix A, which indicates the exact locations for nest sites. I suggest that if you duplicate the report for further distribution, consider Appendix A sensitive information, much as I imagine you do wolf or wolverine den sites. I recommend that only those with a legitimate need to know should be provided this information. Again, thanks for your support.

Sincerely,

Michael Amaral

Enclosures

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A Survey for Cliff-Nesting Birds of
Prey Along the Noatak River, Alaska

by
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and
Craig Gardner

Key Words: Noatak, Endangered Species, Raptors,
Peregrine Falcon, Birds.

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INTRODUCTION

Since 1979, the Endangered Species Division of the U.S. Fish and Wildlife Service in Alaska, in cooperation with other land managing Federal agencies and private contractors, has conducted annual nesting population surveys of Arctic and American Peregrine Falcons (Falco peregrinus tundrius and F. p. anatum). Rivers where concentrations of peregrines are known to occur and which are surveyed annually include the Colville, Sagavanirktok, Yukon, Porcupine, Charley, Tanana and Kuskokwim. In addition to these study areas, this office has conducted surveys in numerous other areas at the request of land managers, when potential resource conflicts or informational needs have arisen.

The Noatak River is fast becoming one of the most popular wilderness river trips for recreationalists in Alaska. Park Service records indicate an increasing trend in visitor use of the drainage since the Preserve's inception in 1980. The need for current information on the species and locations of nesting birds of prey along the Noatak River became apparent with consideration of the following:

1. The last raptor surveys of the Noatak River (in part) were conducted more than a decade ago by John Haugh in 1971 and 1975.
2. In the 11 years that have elapsed since the last survey, peregrine falcon populations elsewhere in Alaska have increased.
3. Several sightings of the threatened, arctic peregrine falcon - one of a banded adult bird - have been recently reported from the Noatak.
4. Recreational visitor use of the river corridor has markedly increased over past years.
5. That birds of prey are vulnerable to disturbance during the breeding season is a fact well documented in literature (Craighead and Craighead 1956; Nelson and Nelson 1978 and Newton 1979).

To provide the National Park Service current information with which to assess possible disturbance to nesting raptors, this work was undertaken at NPS request in 1986. The primary objective of the study was to locate peregrine falcon nesting sites and to locate nest sites of other raptor species and assess their location in relation to potential disturbance from public use on the river. Additionally, we attempted to 1) gather productivity information on each site encountered; 2) collect and identify prey remains found in nests; 3) band nestlings where possible; 4) observe and determine the origin of the banded adult peregrine photographed along the Noatak in 1985; and 5) establish a map and photographic file for all raptor nest sites encountered. Observations of all other birds and mammals were also recorded.

STUDY AREA

The Noatak and Colville Rivers are the primary streams draining arctic interior Alaska (Figure 1). The Noatak is 435 miles long and has eleven rivers 35 to 100 miles in length and 37 named creeks which are tributary

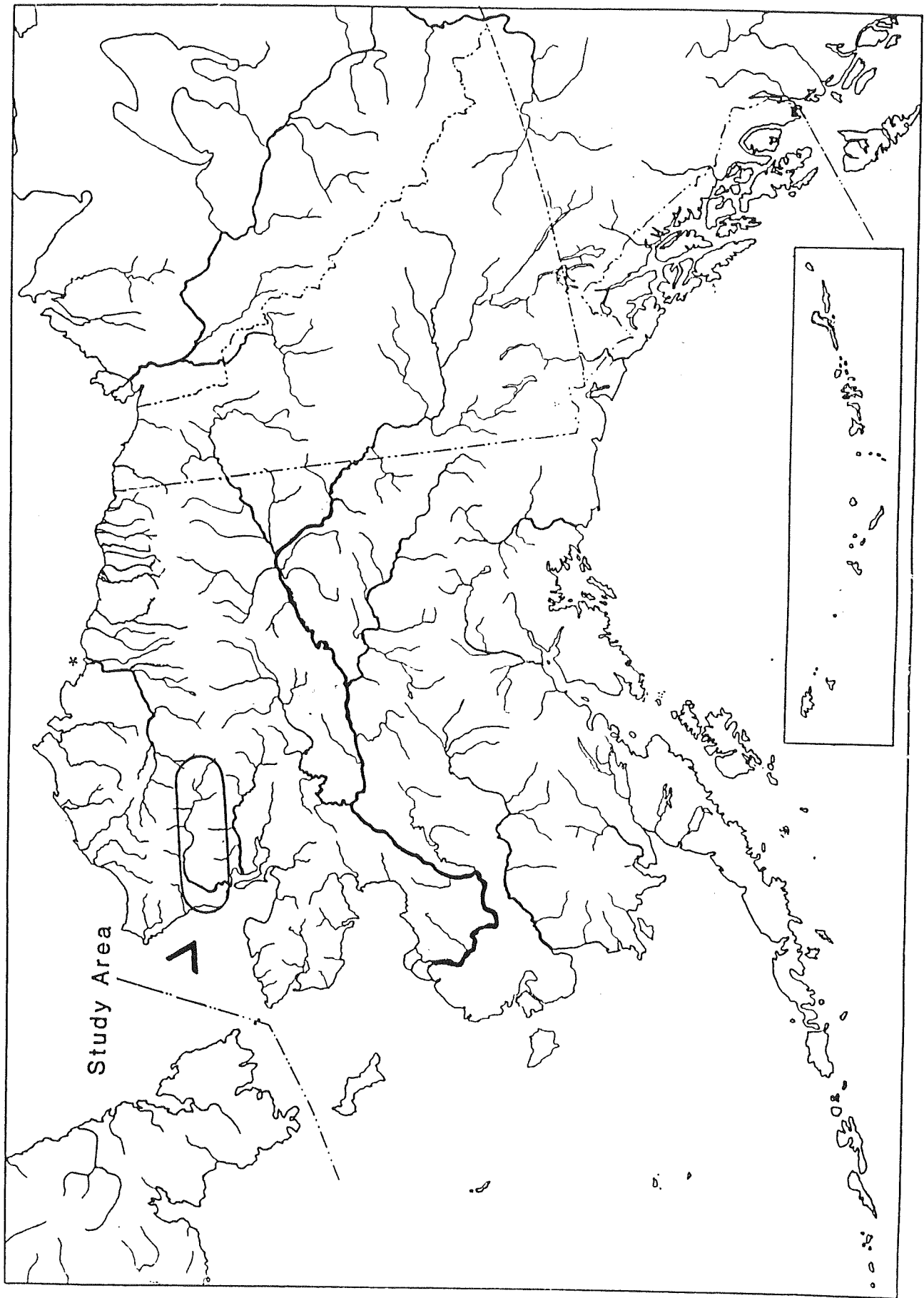


Figure 1. The Noatak River study area in northwestern Alaska. The asterisk denotes the mouth of the Colville River.

(DOI 1974). It is an extensive river system with a remarkably rich flora for an arctic river. Haugh (1975) described the Noatak valley region in terms of interest to cliff-nesting birds of prey. The following is paraphrased from Haugh's report.

For the first 80 miles, the Noatak flows north and west through a wide, U-shaped valley with mountains rising along its sides to between 5,000 and 8,000 feet. Although the river has exposed low sand and dirt bluffs in this region, the nearest cliffs of any significance are found at the base of the mountains, one-half to 2 miles away from the river.

Approximately 31 miles upstream from its confluence with the Aniuk River, the Noatak enters an area of low rolling foothills and flats which continue as far as the mouth of the Nimiuktuk River, a distance of close to 140 miles. In this section, the river again exposes a few low dirt and sand bluffs, but rock cliffs of any significance are generally lacking. One exception is an area 20 miles upriver from the mouth of the Nimiuktuk where a rock strata 30 feet in height has been exposed by the action of the river.

From the Nimiuktuk downstream to a point 5 miles above the mouth of the Kugururok, a distance of approximately 80 miles, the Noatak passes through an area known as the Grand Canyon of the Noatak. Here, mountains ranging from 2,000 to 4,000 feet border the valley. Throughout this section of river, small to medium rock outcrops and cliffs periodically occur, and for the last five miles, impressive rock walls border the river on both sides as the Noatak passes through a relatively narrow canyon.

Five miles upriver from its confluence with the Kugururok, the Noatak enters into a broad, flat, spruce-covered valley. From here to the outfall, a distance of approximately 110 miles, rock cliffs occur only where the river passes through the Igichuk Hills, about 30 miles upriver from its mouth in Kotzebue Sound.

Rock cliffs and outcrops along the Noatak are usually composed of sandstone and shale, but areas of granite and quartz are at times encountered. Extreme temperature fluctuations have severely fractured the rock, and all cliffs require caution when climbing on them. Except for the bluffs at the lower end of the Grand Canyon, which reach 440 feet, cliffs along the Noatak are generally less than 200 feet in height.

Figure 2 depicts the Noatak and its main tributary streams. It also shows that portion of the Noatak (370 miles) that we surveyed in 1986.

METHODS

Access to the upper Noatak River was provided by a Cessna 185 aircraft. A single trip downriver was made with collapsible kayaks made by Folboat. The kayaks were used to float the river from just below Lake Matcharak to the confluence of the Kelly River. An NPS chartered Bell 206 B helicopter was employed to aerially survey the slower moving lower portion of the Noatak from the Kelly River to Kotzebue.

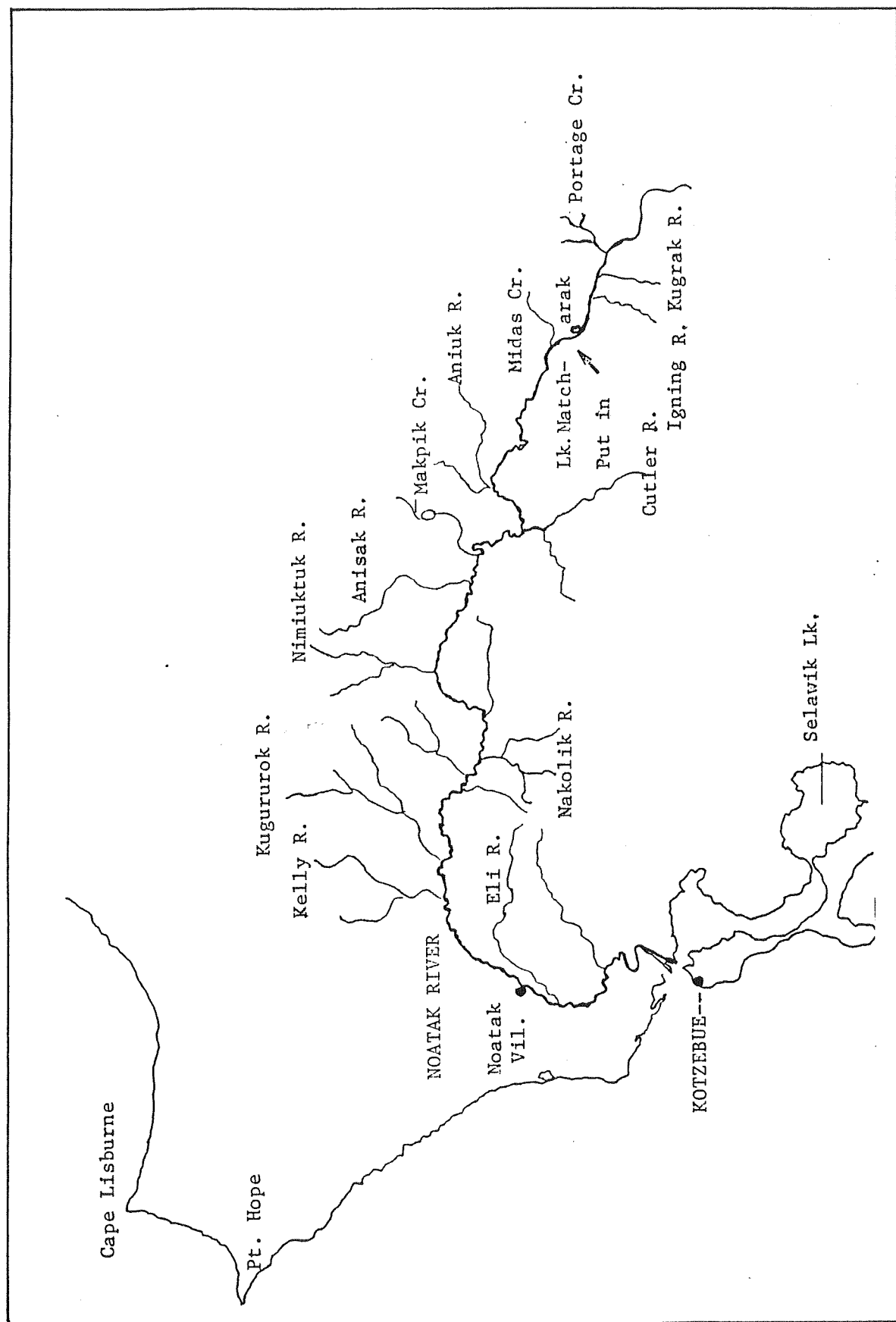


Figure 2. The Noatak River and its main tributary streams. The arrow near Lake Matcharak indicates the beginning point of the survey.

The survey was conducted by two observers, and as noted, the observations of others present in the study area during the same time period have been included. Observations were made with standard variable power spotting scopes and binoculars. The locations of all raptor nest sites were plotted on USGS, 1:250,000 topographical maps. An Alvin map measurer was used to determine the location in kilometers (km) of raptor nest sites from the headwaters of the river. For example, 54 km refers to a location 54 km downriver from the headwaters of the main stem of the Noatak River. This method of labeling nesting locations allows for sequential coding of an infinite number of locations.

Difficult nest sites were accessed using standard climbing equipment; however, most eyries were accessible without the aid of climbing gear. The age of nestlings was estimated by comparing relative body size and feather development with photographs of known-age young (Moritsch 1983a and b). A nest was considered active when fresh grass or twigs, eggs or shell fragments, accumulations of fresh white wash, prey remains, nestlings or defending adults were observed. As we were present only during a two week period, we were not able to assess fledging success for most sites.

RESULTS

Peregrine Falcons

Peregrine falcons were observed in four locations along the Noatak River in 1986. All after-hatch-year peregrines observed were adult plumaged birds. Two pairs, at 340 km and 490 km, each had three young at the time of our visit (Appendix A). A defensive pair was also encountered along an east bank dirt bluff just below the Cutler River mouth, at 259 km, but a thorough search did not reveal a nest. A weakly defensive pair of rough-legged hawks (Buteo lagopus) was also present at this location, but similarly, no nest was found. Recent heavy rain had eroded large sections of this unstable bluff and by the behavior of both pairs, we surmised that their nests had recently been lost.^{1/}

A single, adult peregrine was also seen just downriver from the mouth of Sapun Creek at 414 km. We did not find an eyrie near this location; however, there was a fair amount of fractured rock cliff set back from the river in this area and we could easily have missed a nest site. Brad Johnson's 1985 observation of a nesting pair occurred approximately 20 km upriver of this location near Uyon Lakes.

Peregrine falcon nestlings we encountered on the Noatak ranged in age from approximately 7-14 days (Table 1). As expected, the phenology of the two nesting pairs was similar but slightly earlier than that reported for arctic peregrines nesting along the Colville River (Dittrick and Morehead, 1983) and about 15-20 days later than American peregrine falcons breeding in interior

^{1/} Jim Silva of the Bureau of Land Management reported that a large percentage of rough-legged hawk nests failed along the Colville River between June and August, 1986, due to nest loss through erosion (pers. comm.).

Table 1. Nesting phenology of peregrine falcons on the Noatak River, Alaska, 1986.

Event	Mean Date ^{1/}	Range
Egg laying	May 30	May 27 to June 1
Incubation	June 3	June 1 to 5
Hatching	July 5	July 3 to 8
Fledging	August 11	August 7 to 17

^{1/} Calculated from estimated mean age of nestlings, 12 days (n=6) on 17 July 1986. Intervals used as follows: 7 days for clutch completion; 32-34 days for incubation beginning 4 days after first egg; 35-40 days for fledging (first flight from nest).

Alaska along the Upper Yukon River (Ambrose-USFWS, pers. comm.). There are no previous phenology or productivity data available for peregrines along the Noatak River with which to compare these data. Four of six nestlings observed were banded (Appendix B). Two other nestlings were too young to hold a band at the time of our visit. Prey species identified from remains found in nests included willow ptarmigan, lapland longspur, white-crowned sparrow, Baird's sandpiper, and Catharus thrush. Both successful eyries had south or southeastern exposures, were below 30 meters (100 feet) in height above the river and were easily accessed without climbing equipment.

A pair of unidentified falcons was observed along the Noatak above Lake Matcharak by two Kotzebue residents and Roger Siglin, of the NPS, Fairbanks. Both parties put in at the upper headwaters. Considering that we did not survey the upper 100 km of the river and Brad Johnson's observation in 1985, it is reasonable to estimate that 4-6 pairs of peregrines are currently nesting along the Noatak River. The Colville River is by far the most important river system in arctic Alaska for nesting arctic peregrine falcons. However, this new information places the Noatak among those rivers second to the Colville - such as the Sagavanirktok, Ikpiuk and Etivluk that are also important to the arctic peregrine.

While numerous authors have done avifaunal investigations of the Noatak river corridor (McLenegan 1887; Hines 1963; Manuwal 1974; and Dean and Chesemore 1974), prior to this study, only Haugh in Fyfe et al. (1976) conducted surveys to specifically locate cliff-nesting birds of prey. The earliest report of peregrine falcons in the Noatak drainage is apparently from E.S. Hall, an anthropologist who identified one and possibly two pairs nesting along the river in the early 1960's (Fyfe et al. 1976). During the 1970's, both Manuwal (1974) and Dean and Chesemore (1974) reported peregrines as resident birds, although no evidence of nesting was documented. Haugh conducted the first raptor survey of the Noatak River in 1971 and 1975 and documented nesting by several raptor species; however, no peregrines were found. This lead Haugh in Fyfe et al. (1976) to conclude "this species is not now a part of the nesting avifauna of the Noatak Valley."

In the 1980's, NPS employees, as well as others travelling the river reported observing peregrines in cliff areas where nesting was suspected. In 1985, Brad Johnson, a Kotzebue resident, reported a nesting pair with one young and provided photographs not only positively identifying the bird but also clearly showing that it wore a metal U.S. Fish and Wildlife Service leg band. This evidence suggests that small numbers of peregrines nested along the Noatak in the past and that the species was no longer present in the drainage as a breeding bird by the mid-1970's - when peregrine populations across North America were at their nadir. Following the ban on DDT in the United States in 1972, peregrine populations in Alaska slowly recovered, and are now repopulating former breeding habitat. The bird observed by Johnson in 1985 was probably banded as a nestling several years before on the Colville or Sagavanirktok Rivers, and has now established a breeding territory on the Noatak. Unfortunately, we did not encounter this bird in 1986, so its natal area remains unknown.

OTHER RAPTORS

Other cliff-nesting birds of prey observed along the Noatak included gyrfalcons (Falco rusticolus), golden eagles (Aquila chrysaetos) and rough-legged hawks. The northern harrier (Circus cyaneus) was the only non cliff-nesting raptor observed in the study area.

Rough-legged hawks

Rough-legged hawks were the most successful raptor nesting along the river in 1986. A total of 14 stick nests were found; nine were unoccupied and five were active. Four of the five active nests were successful, containing a total of nine young, for an average of 1.8 young per total pairs or 2.3 young per successful pair. As previously noted, it is suspected that the pair at bluff 291 km lost their nest due to rain and erosion. Haugh (1975) reported three active nests for this species in 1975 and none in 1971. Ground squirrels were common in 1986 and there appeared to be habitat suitable to support many more nesting pairs of this hawk. Haugh speculated that this hawk may possibly be limited by the presence of golden eagles, which sometimes prey on young rough-legs and compete with them for nest sites and food. Rough-legged hawk nestlings we encountered ranged in age from 22 to 30 days and all nine were banded (Appendix B). Table 2 summarizes the chronology of the four rough-legged hawk nests we observed. Willow ptarmigan, arctic ground squirrel, lemmings, microtines, and small birds were the predominant food items found in rough-legged nests in 1986 (Table 3).

Eight of the nests we observed (57%) were on bluffs that had either a southern or southeastern exposure. Only one nest had a northern exposure. The average height above the river for the 14 nests was approximately 21 m (70 feet, range 30-125 feet). All but one were easily accessible without the aid of climbing equipment.

Gyrfalcons

Among the cliff-nesting raptor species in arctic Alaska, only the gyrfalcon is largely, non-migratory. Like the cliff-nesting northern raven (Corvus corax), gyrfalcons initiate nesting in early spring and nestlings fledge well in advance of other species. We observed gyrfalcons at two locations, a single gray phase bird between 108-110 km and a nesting pair with three fully feathered young at 397 km. Single gyrfalcons were also observed between Kugrak and Igning Rivers near 70 km and in Noatak Canyon, 488 km, by Roger Siglin and Marc Matsil, respectively (personal communication). One of the three young in the eyrie we observed on the southeast facing bluff at 397 km had already taken its first short flight on July 16. This indicates that this pair initiated egg-laying and incubation in late April. Haugh (1975) found gyrfalcons nesting at four locations in the Noatak Valley in 1975 and observed birds not associated with nests in three other locations. Two of the eyries found by Haugh were located on tributaries to the Noatak River (Akikachiak Creek and Nakolik River). Brad Johnson also located gyrfalcon eyries along tributary streams (the Eli River and Uvgoon Creek). We did not check these sites in 1986. The numbers of gyrfalcons nesting along the Noatak will likely fluctuate from year to year depending largely on the availability of prey. Nevertheless, the gyrfalcon may be the most abundant cliff-nesting raptor in

the Noatak Valley. Due to their early nesting phenology, and their use of habitat along tributary creeks, a survey during July limited primarily to the mainstem will certainly underestimate their numbers.

Golden eagles

We observed a total of 25 golden eagle stick nests during the survey, but only two appeared to be active in 1986. A nest at 140 km was located on a south-facing sweep of the river where the current was swift. The nest was only 9 m (30 feet) above the water and easily accessible. Floaters scouting the riffles at this location will inadvertently disturb this pair. A single, 5-week old eaglet was present and banded on July 10. Two adult eagles and a subadult were present in the area but did not defend the nest site while we were present. The other active eagle nest was on Sekuiak Bluff in the canyon at 487 km. This unsuccessful nest was 53-61 m (175-200 feet) high on an east-facing cliff, contained fresh nest material, abundant white wash and was weakly defended by a single subadult bird. Newton (1979) reports that in the rare instances that subadult birds held nesting territories in Scotland, most failed to lay eggs. A total of 15 eagles were observed in flight. Of the 12 that we could identify to age, five were adult birds and seven were subadults.

Golden eagles are often known to construct and utilize two or more alternate nest sites within the same nesting territory. Of the 25 total eagle stick nests we observed, many were clumped in distribution and probably represent a total of 10 nesting territories. Of the 25 nests, 88% had either a southwest, south, or southeastern exposure. Only one nest faced north. Average nest height above the river was approximately 37 m (range 30-200 feet). A southern exposure may enhance success for arctic nesting raptors by facilitating nestling thermoregulation. Perhaps more importantly, the southern slopes may be the only nesting habitat free of snow in spring when breeding activities are initiated.

It is noteworthy although not unusual, that only 20% of the ten eagle territories were occupied in 1986. Only one of five territories (20%) along the Canning River and four of 18 along the Kongakut river (22%) were active in 1984 (Amaral and Benfield 1985). Haugh found two active eagle nests along the Noatak and three along tributary streams in 1975. In 1971, Haugh reported that five eagle nests on the Noatak were occupied and that both hare and ground squirrel remains were present in nests. Arctic ground squirrel, willow ptarmigan and lemming were identified from remains found in or near golden eagle eyries in 1986. Hare remains were not found in 1975 or during our study. It would be very interesting to determine what percentage of eagle territories were active during a year when rodent and hare populations were high.

Northern harrier

The northern harrier is the only non cliff-nesting raptor of significance that we observed along the Noatak. Harriers were seen in seven locations (Appendix A) - all were sightings of single birds (3 males, 3 females and 1 unidentified). No attempt was made to locate the ground nests for this species.

Table 2. Nesting phenology of rough-legged hawks on the Noatak River, Alaska, 1986.

Event	Mean Date ¹	Range
Egg laying	May 20	May 17 to 25
Hatching	June 19	June 16 to 24
Fledging	July 29	July 27 to August 3

¹ Calculated from estimated mean age of nestlings, 24 days (n=9) on 15 July 1986. Intervals used as follows: 31 days for incubation and 41 days for fledging (Newton 1979).

Table 3. Identification of prey species from castings and remains found in rough-legged hawk nests, Noatak River, Alaska, 1986.

Species	Frequency of Occurrence % ¹
Willow ptarmigan	58
Arctic ground squirrel (<u>Spermophilus parryii</u>)	50
Lemming (<u>Lemmus</u> spp.)	33
Tundra Vole (<u>Microtus oeconomus</u>) and Singing Vole (<u>M. miurus</u>)	33
Other birds ²	25
Ermine (<u>Mustela erminea</u>)	8

¹ N=28 (4 nests and 24 castings).

² Includes Lapland longspur, yellow warbler, gray jay, common snipe, American tree sparrow, and unidentified shorebird.

Northern ravens

Although ravens are phylogenetically within the order Passeriformes, (and are not raptors); ecologically, they are noteworthy during surveys for birds of prey because the stick nests they construct on cliff faces are sometimes used by raptor species such as falcons and rough-legged hawks. Like gyrfalcons, ravens are largely resident birds and initiate nesting in early spring. Because they occupy cliffs early in the year, they can often secure the best sites, i.e., those cliffs that are vertical and have an overhang for protection from weather. Many of the raven nests we observed fit this description. Unfortunately, ravens had already fledged by the time of our survey, but 10 of the 12 nests had accumulations of white wash and appeared active. Curiously, only two family groups were observed along the river. Manuwal in Young (1974) reported observations of adults with fledglings on June 26 and 27.

Other Birds

A total of 69 bird species were observed during the survey (Table 4). One of the most common predatory birds encountered along the river was the northern shrike. No fewer than 10 family groups were observed. Haugh (1975) and Manuwal in Young (1974) also recorded shrikes but not nearly as many as were present in 1986.

Little information exists on the distribution of Smith's longspurs in northwestern Alaska (Dan Gibson-UAF, pers. comm.). We observed this species on two occasions, between Midas Creek (110 km) and Atongarak Creek (190 km) in the upper Noatak. No other unusual or accidental species were observed.

DISCUSSION and RECOMMENDATIONS

Without recent data with which to make comparisons, it is not possible to assess whether visitor use has had any effect on the cliff-nesting raptor community of the Noatak. However, the baseline information gathered in 1986 should make the monitoring of these species an easier task in the future. Researchers conducting future surveys for birds of prey along the Noatak should begin as high in the headwaters as water conditions will allow. Also, an effort should be made to examine suitable habitat along tributary creeks.

Except for the birds nesting on Sekuiak Bluff in Noatak Canyon, the majority of the nest sites we encountered were right along the river and were easily accessible without climbing gear. Therefore, most of the raptor eyries along the Noatak are inherently vulnerable to disturbance from the overzealous photographer, the curious and uninformed, or those insensitive enough to camp too close to an active nest site. There is no reason why the present and anticipated continued increased level of visitor use couldn't occur with little or no effect on the raptor community if a few precautions are observed. Visitors should be advised that during their float trip, they may see a number of hawks, eagles and falcons. They should enjoy observing these birds from a distance or as they float by, but should not stop below or directly across from nest sites, and should not try to approach nests or climb cliffs upon which raptors are nesting. This is not only common sense and good wilderness

ethics, but to act otherwise could be a violation of the Endangered Species Act and/or the Migratory Bird Treaty Act. Perhaps the NPS could provide an informative leaflet to river floaters advising them of proper etiquette in bear/raptor country.

The numbers, species, and locations of raptors nesting along the Noatak will likely fluctuate from year to year due primarily to natural cycles in prey abundance and availability. Peregrines, which prey almost exclusively on other birds, should exhibit less population fluctuation because, unlike the food sources for rough-legged hawks and eagles (hares and rodents), peregrine prey are not cyclic. Future efforts to monitor the possible effects of increased visitor use on the raptor community will probably be most fruitful if they are focused on examining the success rate of raptors attempting to nest. This can only be attained by conducting a minimum of two surveys - one early in the breeding season to locate all nesting attempts and then later in summer when large young will be present in successful nests. This could be accomplished at minimum cost by using volunteers experienced in raptor studies.

We were very encouraged to find peregrines at four locations in 1986 and hope that the NPS will continue annual or biennial surveys of these and all the raptor nesting locations described in this report and in Haugh (1975).

Table 4. Checklist of birds observed along the Noatak River between Matcharak Lake and Kotzebue, Alaska, July 1986.

Species	Dates Observed												
	July 7	8	9	10	11	12	13	14	15	16	17	18	19 ² / ₁
Red-throated loon							X	X	X	X	X	X	
Pacific loon												X	
Common loon												X	
Tundra swan													X
Canada goose	X												
Green-winged teal													X
Mallard			X										
American wigeon		X	X										
Greater scaup	X ¹ / ₁		X	X				X					
Common eider													X
Harlequin duck								X		X	X	X	
Oldsquaw	X ¹ / ₁												
Red-breasted merganser			X	X		X	X	X	X	X	X	X	
Northern harrier	X			X		X					X	X	X
Rough-legged hawk							X	X	X	X	X	X	
Golden eagle			X	X	X				X			X	
Peregrine falcon							X	X		X		X	
Gyr Falcon	X	X	X							X			
Willow ptarmigan									X	X			
Sandhill crane												X	X
Lesser golden plover		X	X	X	X	X	X	X	X	X	X	X	
Semipalmated plover					X					X	X	X	
Greater yellowlegs			X	X				X					
Wandering tattler								X					
Spotted sandpiper			X	X				X	X	X	X	X	
Upland sandpiper	X	X	X	X							X		
Whimbrel								X	X				
Black turnstone	X ¹ / ₁												
Semipalmated sandpiper	X ¹ / ₁												
Least sandpiper				X									
Baird's sandpiper	X ¹ / ₁												
Common snipe						X		X	X				
Red-necked phalarope	X ¹ / ₁	X		X	X		X						
Parasitic jaeger				X	X	X	X	X	X			X	
Long-tailed jaeger				X	X	X	X	X	X	X	X		X
Mew gull	X	X	X	X	X	X	X	X	X	X	X	X	X
Herring gull				X	X								
Glaucous gull	X		X	X	X	X	X	X	X	X	X	X	X
Arctic tern	X	X	X	X	X	X	X	X	X	X	X	X	X
Aleutian tern	X ¹ / ₁												
Belted kingfisher											X		
Alder flycatcher	X	X								X	X		
Say's phoebe			X	X				X	X	X	X	X	
Tree swallow	X	X											

Checklist of Birds Observed Along the Noatak (continued).

Species	July 7 ^{1/}	8	9	10	11	12	13	14	15	16	17	18	19 ^{2/}
Bank swallow		X	X	X	X	X	X	X	X	X	X	X	
Cliff swallow				X									
Gray jay			X	X						X	X	X	
Common raven	X ^{1/}						X	X	X				X
Arctic warbler									X	X	X	X	
Gray-cheeked thrush										X			
Swainson's thrush							X	X	X	X			
American robin	X	X	X	X	X	X	X	X	X	X	X	X	
Varied thrush													X
Yellow wagtail	X	X	X	X	X	X	X	X	X	X	X	X	X
Water pipit	X	X	X	X	X	X	X	X	X	X			
Bohemian waxwing									X	X			
Northern shrike				X	X	X	X	X	X	X	X	X	
Orange-crowned warbler			X						X				
Yellow warbler										X			
American tree sparrow	X	X	X	X	X	X	X	X	X	X	X	X	
Savannah sparrow	X ^{1/}									X			
Fox sparrow								X	X	X	X	X	
Lincoln's sparrow						X	X	X	X	X	X		
White-crowned sparrow	X	X	X	X	X	X	X	X	X	X	X	X	
Lapland longspur		X			X	X							
Smith's longspur		X			X								
Rusty blackbird													X
Redpoll spp.	X	X	X	X	X	X	X	X	X	X	X	X	
Hoary redpoll ^{3/}		X			X								

^{1/} Birds were observed in Kotzebue.

^{2/} Birds were observed from helicopter between Kelly's Bar and Kotzebue.

^{3/} Common and hoary redpolls were combined except on days listed when hoaries were identified.

Literature Cited

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